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## A LESSON IN GEOGRAPHY—FROM CHICAGO TO THE ATLANTIC

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The relative merits of teaching geography from books alone or from the earth itself is no longer a debatable question in any body of intelligent teachers. "Things before words" has become axiomatic. But in education we are prone to accept a principle in theory long before we put it into practice.

If any teacher cares to test the principle for himself, let him take a class into the field for several weeks of study. The teacher as well as the pupil will meet with many surprises. The teacher will detect even his best students gazing with unintelligent eyes upon a rich and interesting landscape, while the student will find that many subjects with which he had an intimate friendship in textbooks are indifferent strangers when met in nature.

Training in the ability to image from another's expression, to think through another's thoughts, to reason from premises established by someone else, does not develop initiative nor give power in action. It does not insure that a student can recognize even the things which he has described with satisfaction to the instructor, nor give him power to discover and organize a problem in the field—forming his own working hypotheses, discovering relevant data. But after a few weeks in the field the students seize upon a problem and follow it up day after day with increasing interest and enjoyment.

In reply to the question, "What of that called geography do the students learn on a field trip of a month or six weeks?" I submit the following superficial description of the region visited and the work done by a class of college students, School of Education, University of Chicago, during the second term of the last summer quarter.

The class was composed of fourteen teachers. Of the num-

ber, seven teach in normal schools, "teachers of teachers;" one is principal of a public school in one of the largest cities of the country; three are special instructors in geography in elementary schools; two are grade teachers; one is a graduate student.

#### THE ITINERARY

The party left Chicago at nine o'clock, the morning of July 30, over the Big Four Railroad for Louisville, Ky. The day was spent, as all others on the train, in making and recording observations on the topography, soil, rocks, vegetation, crops and other cultural features of the region passed through.

The special problem for the first day was to determine the limit and characteristics of the glacial drift along the route.

The first stop was made at Louisville to study the Ohio River valley, the falls, and sink holes which are finely illustrated here.

At Charleston, W. Va., the class made observations on the form and terraces of the valley of the Kanawha River; studied the sedimentary rocks of the Carboniferous period, the exposures of which along the bluffs of the river show excellent examples of the interbedding of coal; visited Malden, eight miles east of Charleston, to see the salt-works which have been so potent a factor in the history of this part of West Virginia; and studied the region of Coon Skin Creek, which occupies a part of the abandoned valley of the Elk River, a tributary of the Kanawha.

The next stop was made at Kanawha Falls for a study of the falls, the foundry of an aluminum company, and the great potholes in siliceous conglomerate exposed in the rock terrace at Gauley Junction. The night was spent at Thurmond, which boasts the only good hotel between Charleston and Clifton Forge. At Thurmond a coal-mine was visited, after which the party proceeded to Clifton Forge, Va.

On this journey the point of special interest, aside from the study of the New River cañon, was the discovery of the beginning of the folding and crumpling of the rock, which had appeared horizontally bedded throughout the region previously traversed.

A stop was made at Clifton Forge to study the great fold in the rocks called Rainbow Arch, which is exposed in the cañon of the Jackson River where it cuts through the Rich Patch Mountains. Just below the cañon, known as the Iron Gate, the Jackson River joins the Cow Pasture River to form the historic James.

South Glasgow was selected as the next stopping-place. It is a tiny village in the "Great Valley" just west of the Blue Ridge, at the beginning of the cañon which the James River has chiseled in its tortuous course through the mountains. From this village the Natural Bridge Region was visited. Mount Salling was climbed for a view of the "Great Valley." The contact between the sedimentary rocks to the west and the igneous rocks of the Piedmont was found about a mile below the village, exposed in the cañon of the James.

For a study of the Piedmont country and the tobacco industry, Lynchburg seemed the most desirable spot. From Lynchburg the James River was followed "on to Richmond." Here the Coastal Plain formations were seen lying just over the igneous rocks of the Piedmont; the contact was found in Shockoe Creek back of the Old Medical College; and visits were made to places of historic interest. On leaving Richmond, a part of the class went down the James River by boat to see the famous old homesteads—Shirley, Berkeley, Westover, Upper and Lower Brandon—and landed at the deserted spot where Jamestown once stood. The remainder of the party reached Williamsburg by rail, and drove the seven miles to Jamestown. After visits to some of the historic places in Williamsburg, and a boat trip to Yorktown by way of the wide tidal Queen's Creek and the York River, we journeyed to Hampton, where we were entertained at Hampton Institute, that excellent and interesting school for the training of Indians and negroes.

From here we visited the shipyards at Newport News, and went to Norfolk, Virginia Beach, and Cape Henry. At Cape Henry the fine examples of sand-dunes were studied. The Jamestown Exposition Grounds are in plain view in crossing the Bay from Old Point Comfort to Norfolk, being just south of

Sewall Point, about five miles north of Norfolk. The trip from Hampton to Washington was made by boat, and while in Washington visits were made to the United States departments of geology, agriculture, soils, ethnology, entomology, and forestry. We were cordially received by the men in charge, who generously gave their time in instructing us as to the purposes of each of the departments and the character of its work. Through the special kindness of Dr. Hayes, of the Department of Geology, we were introduced to some of the interesting geological formations about Washington. After visiting Mount Vernon, Arlington, the Capitol, the Congressional Library, and other points of interest, we left Washington<sup>1</sup> for Luray, Va., over the Baltimore & Ohio Railroad to Shenandoah Junction, and the Norfolk & Western to Luray. A stop was made at Washington Junction,<sup>2</sup> about three-fourths of a mile east of "Point of Rocks," where the Potomac breaks through the Catoclin Mountains, twelve miles east of Harper's Ferry and forty-two miles from Washington.

On leaving Luray we continued up the Shenandoah valley to Basic City. After securing a magnificent view of the Shenandoah valley from the top of a hill, we crossed the valley to Clifton Forge, returning home over the line traversed in the onward journey, reaching Chicago, August 31.

#### SPECIAL POINTS STUDIED

*General division.*—The reason for selecting the special area from Chicago to the Atlantic Ocean was to give the students a view, although necessarily superficial, of the type land forms which constitute the eastern half of this continent, and which have played so great a rôle in the history of our people. These divisions are known as the Alleghany Plateau, which extends from the Alleghany Front to the Mississippi River; the Appalachian Mountain region, including the region from the Alleghanies to Blue Ridge; the Piedmont, from the Blue Ridge to the "Fall Line," which passes through Washington, Rich-

<sup>1</sup> A part of the class was obliged to return home from Washington.

<sup>2</sup> Within the distance of two miles along the railroad are excellent exposures of Juratrias, Cambrian, and Algonkian formations.

mond, Columbia, Augusta, and Macon; and the Coastal Plain, which extends from the "Fall Line" to the Atlantic Ocean. An attempt was made to trace the limit of each of these divisions along the route of travel. The rocks of the Alleghany Plateau are sedimentary, that is, made from materials deposited in water, which formed the sandstones, limestones, shales, and conglomerates of this region. The rocks are nearly horizontally bedded, looking like layers of a cake, as they are exposed in the bluffs of the numerous rivers which have dissected the plain.

The horizontal stratification of the rocks continues to a point near Hinton, W. Va., where slight tilting of the layers is first observed. Just east of Hinton, near Talcott, decided folding appears. The most perfect example of the Appalachian type form, however, on this route is the Rainbow Arch at Clifton Forge. Here the quartzite rocks have been forced up, forming a beautiful solid arch.

The sedimentary rocks, tilted, folded, and contorted, continue to a point just below a station known as Balcony Falls, Va. Here, in the Blue Ridge, the sedimentary rocks lie against the granite of "Appalachia," the old continent from which the sediments now made into the Appalachian Mountains were doubtless derived.

From Balcony Falls granites, schists, and gneisses are the dominant rocks to Richmond, Va., where the older rocks disappear under the Coastal Plain.

Besides making the acquaintance of these broader areas referred to above, opportunity was afforded for the study of certain of the earth-shaping forces, as the work of glaciers, surface streams, underground water, wind, waves, tides, ocean currents, and diastrophism. Stops were made where the most marked expression of any of these forces was exhibited. The vegetation, industries, and historic places were not overlooked.

*Glaciated country.*—The glaciated region was crossed between Chicago and Greensburg, Ind., a distance of about 240 miles. It was studied from the car windows only, but from even so superficial a view some knowledge of the topography and of the materials which compose the drift can be obtained. We left

the level Chicago Lake plain near Homewood, Ill., going on to the rolling Valparaiso moraine. The surface of the glaciated region traversed is for the most part rather level, but relieved in places, however, by heterogeneously distributed hills, and dotted with swamps and ponds. Boulders are scattered aimlessly about, and the railroad and river cuts expose the clays, sands, and gravels which compose the drifts. The kind and condition of crops also told the story of the nature of soil.

*Underground water.*—The work of underground water, which, by reason of its concealment, is always surrounded with a certain mystery and fascination, reveals its "black arts" in the limestone region of southern Indiana, Kentucky, and the "Great Valley" in Virginia just west of the Blue Ridge Mountains. We stopped at Louisville, Ky., to study at close range the interesting depressions in the surface of the country known as "sink holes." In Cave Hill Cemetery, Louisville, are fine illustrations of this type of the work of underground water. When the rock has been dissolved until the roof of a cavern becomes too weak to support itself, it collapses, leaving these depressions in the surface. Sink holes are sometimes very shallow, and look like huge saucers; again, they may be elliptical in shape, while their depth may be measured in inches or in hundreds of feet. These pits or depressions are frequently filled with water, making ponds and lakes in regions whose surface drainage is otherwise well developed. Throughout the Blue Grass region and the "Great Valley" the eye becomes skilled in recognizing "sink hole" landscapes. At Luray Cave in the Shenandoah valley, about fifty-five miles southwest of Harper's Ferry, are very striking results of this wonderful agent. In these caverns are displayed the most beautiful formations of stalactites and stalagmites, rivaling exquisite tapestry in design and color. These remarkable deposits certainly suggest power no less than magic.

While the caverns of Luray are among the most beautiful of their kind, they are not more interesting to the student of the work of underground water than the region about Natural Bridge, Virginia. Not only the celebrated bridge, but also the caves, sink holes, calcareous deposits, and roaring "Lost River"

all bear unmistakable evidence of the solubility of limestone. An interesting deposit of calcareous tufa, or travertine, may be found along the road about half-way between the famous bridge and Natural Bridge Station, three miles distant. The little stream flowing parallel to the highway is overcharged with calcareous matter which is precipitated in a beautiful terraced mound resembling, in form at least, that of the Mammoth Hot Spring in the Yellowstone Park.

*Surface streams.*—The work of running water upon the surface of the land is no less wonderful than that of underground water in its degrading and aggrading power; but its results are always before us, and hence become so familiar that they cease to stimulate the imagination, unless the grandeur of the scenery arrests the attention. In passing through the cañon of the New River from Kanawha Falls to Glades, W. Va., the Iron Gate near Clifton Forge, the cañon of the James at Balcony Falls, and through the gorge in Blue Ridge at Harper's Ferry, the aesthetic emotions frequently crowd out intellectual calculations, and it is not until the milder and more familiar type of landscape is reached that the meaning begins to be realized.

The description of the various results of the work of surface streams cannot here be given, but of the work of surface streams there is no form of wearing or building possible to rivers that is not well illustrated in some part of the region under consideration. There are valleys in every stage of erosive history, from the narrowest steep-sided gorge to the wide, level-bottomed, flood-plain; falls, terraces, islands, deltas, abandoned valleys, drowned valleys, with all the phenomena these terms imply.

*Cultured influence of rivers.*—The cultural influence resulting from the work of running water could not be overlooked. The magnetic attraction for railroads exercised by valleys was everywhere noted. From Ashland, Ky., to Richmond, Va., a distance of 373 miles, one is seldom out of sight of water. The distance of about twenty miles between Huntington, W. Va., and Scary, where the wide Teay Valley is traversed, must be excepted. This depression is believed to be the abandoned valley



of the Kanawha River, but now only the insignificant Mud River flows through it for a part of its course.

When the Kanawha occupied this valley it is probable that the Ohio River did not exist, but that the Kanawha ran almost due west from just below St. Albans, instead of northwest as at present. It continued through the present Scioto River, and discharged toward the north. The subsequent ponding, during the glacial period, of the north-flowing rivers gave birth to the Ohio.<sup>3</sup> The effect of falls upon the human history was noted at many places. The falls or rapids in the Ohio River at Louisville were almost obliterated at the time of our visit by the high waters due to excessive rains; hence it took no little stretch of the imagination to realize the great influence these falls had had upon the development of the Middle West. But George Rogers Clarke appreciated the importance of this interruption of the navigation of the Ohio as early as 1778, and made the beginning of the present important city of Louisville.

The next falls of note are the Kanawha Falls, about a mile below the point where the clear waters of the Gauley River join the boiling chocolate of the New to form the Kanawha. These picturesque falls at the entrance of the beautiful gorge of the New River have as yet exerted little power as an urban stimulus, the result being the miserable little village of Stockton. Notwithstanding the insignificance of this hamlet, chromium from Turkey, Caledonia, Brazil, and Canada has found its way here to meet the coal, iron, and sand of the region, and armor plate for war vessels is the result.

The last falls seen going down the James River are of great importance, for they have given to Virginia her famous capital, and have stimulated many industries.

Of the numerous factories which line the banks of the James River at Richmond, we visited but one—a blotting-paper manufactory. We were surprised to learn here that American rags are not sufficiently worn to be used in making the finest blotting-papers, and that “best rags” are imported from Egypt, Turkey, Greece, and Germany. Whether our deficiency in this line is

<sup>3</sup> *Geologic Atlas*, Charleston Folio, 1901.

due to our wealth or extravagance may be a debatable question, yet either seems comforting when one gazes upon the great piles of unspeakable, evil-odored rags, and he wonders if the ten-hours' boiling in caustic soda will be sufficient to sterilize the impurities of Europe and Africa. Apprehensive of the danger in such importations, one almost wishes, even in this free-trade-loving region, that there were a prohibitive tariff upon such imports.

While the rapids and falls stimulate manufactories and the growth of cities, the flood-plains of the rivers denominate the rich agricultural lands of many districts. The contrast between the fertile plains along the James River and the exhausted uplands of Virginia is forced upon the attention of the most listless observer. The value of rivers as giant excavators, laying bare the secret riches of the earth in the form of building-stone, minerals, metals, oil, and gas, is strikingly illustrated in the Kanawha and New River valleys from Charleston to Quinns-mont, W. Va., a distance of about seventy-five miles. Here the cliffs, almost perpendicular in places, rising seven or eight hundred feet above the water, are perforated from top to bottom with coal shafts. The buildings at the mouths of the shafts cling to the tree-covered rocks as woodpeckers to the trunk of a tree, while the coke-ovens make a necklace of fire along the seething waters of the New River.

*Tides.*—The recent sinking of the Coastal Plain has so depressed the river valleys as to allow the influence of the tides to be felt many miles back from the sea. The ebb and flow in the James River reach as far as Richmond, eighty-five miles from Old Point Comfort. Even the creeks in the lower Coastal Plain are wide, navigable, tidal rivers.

*Waves and currents.*—The coast between Virginia Beach and Willoughby Spit affords an excellent opportunity for the study of the work of waves and currents as well as of tides. Willoughby Spit, which is about eight miles north of Norfolk, is a typical fish hook of sand, built by the waves and currents for almost three miles out into Hampton Roads. The end of the spit is about equidistant from Old Point Comfort.

*Work of wind.*—The coast also furnishes the best place for the study of the work of wind. A great amount of sand is brought up by waves and currents along the Atlantic in this district, providing material which can be easily transported by the wind. The best example of aeolian deposit is found at Cape Henry. The sand stretches for miles along the coast and reaches back from the famous Cape for about a mile and a half in beautiful cream-colored billows, whose crests rise eighty feet above the sea, burying the struggling forest under their smothering weight.

*Diastrophism—rising and sinking of the land.*—Changes of the surface of the land are not due to the agents of water, ice, and wind alone; for evidences of the internal movements of the earth are seen, not only in the displaced, folded, and contorted rocks of the Appalachian Mountains and the Piedmont, but also in intrusions of igneous rocks in the Piedmont. The records of recent changes in the relation of the land and the ocean are found in the “drowned” valleys of the Coastal Plain—the Chesapeake Bay and the tidal stretches of the James, York, and Potomac Rivers. Old pine-tree stumps, which now stand in the Chesapeake Bay at Buckroe Beach near Old Point Comfort, bear evidence of very recent encroachment of the sea in this region.

*Historical geology.*—The birthdays of landscapes are not marked by the dial of a clock, but by great changes in the surface of the land. When the land has risen after the encroachment of the sea, as seen in the Coastal Plain, a marine deposit is left over the valleys, plains, and hills.

From the evidences of such events, and the changes in life left as fossils in the rocks, geologists have been able to interpret a part of the history of the earth.

By examining a geological map of the eastern portion of the United States, it will be seen that in a trip from Chicago to the Atlantic Ocean one passes over rocks representing all the geologic eras and periods which man has devised for the classification of the great events of terrestrial history. The oldest rocks are called Archeozoic,<sup>4</sup> and are found between the “Fall Line”

<sup>4</sup> The Proterozoic are here included under Archeozoic.

and the Blue Ridge, a distance of 175 miles from Balcony Falls to Richmond. The rocks are mainly igneous, with some sedimentary deposits greatly changed or metamorphosed by pressure, heat, and moisture.

The next great series of rocks in point of age is known as the Paleozoic, and is found between Chicago and the Blue Ridge Mountains. The mountains and valleys, west of the Blue Ridge, in Virginia and West Virginia, the hills and plains of Kentucky and Indiana, as well as the area underlying the drift of Illinois and Indiana, were formed from these sedimentary deposits.

Great metamorphism, occasioned in the process of mountain-making, has changed the sandstones to quartzites, the limestones to marble, and the shales to slates, in many places in the Appalachian mountains.

The formations of the Mesozoic, the next great era, are represented in various places on the Piedmont (these were noted about Washington and Washington Junction), while the Coastal Plain exhibits the youngest sediments known as the Cenozoic. These newly formed rocks are but slightly consolidated sands, marls, and clays.

*Vegetation.*—The vegetation between Chicago and the Atlantic is characterized by a great sameness. Lists of trees and plants made at various places along the route are remarkable for their similarity, the differences being found in the addition or the subtraction of but a few species. Where trees abound one soon learns to expect oak, elm, maple, birch, sycamore, hickory, walnut, alder, willow, ironwood, ash, bass-wood, hackberry, beech, sassafras, chestnut, and pine. These are distributed along the streams or on the higher land, according to the habit of the tree. The holly, magnolia, and cypress, cultivated in Louisville, are abundant in the forests of the Coastal Plain. The wahu, whose fruit at this season resembles that of a small sour sop of the tropics, was common through West Virginia and Virginia. The pawpaw and persimmon, which appeared in central Indiana, continued in greater abundance into Virginia. The *Ailanthus* spreads from the Ohio to the coast.

The uniformity of vegetation due to natural causes of distri-

bution was less surprising than the similarity of crops. From Chicago to the Atlantic one is practically immersed in a sea of corn. I believe that throughout the entire distance there is not a tillable area of any considerable size from which this beautiful tropical-looking plant is absent. The complete domination of corn was broken by an occasional field of wheat- or oat-stubble in Indiana, and by hemp and tobacco in Kentucky. Virginia, where once tobacco was riches and legal tender of the commonwealth, seemed to have submitted herself in servitude to King Corn. When inquiry was made as to the cause of the change in dynasties, the Virginian replied: "The exhaustion of the soil for tobacco, and the price of seventy-five cents per bushel for corn."

Notwithstanding the untiring efforts of the United States Agricultural Department in finding crops best suited to various soils, the average farmer knows and loves corn and wheat, and is slow to change his affections.

So much had we heard of the Blue Grass of Kentucky that our vivid imaginations pictured unparalleled horses and cattle standing side by side up to their necks in blue grass. A veritable agricultural and grazing fairyland! Hence the contrast with the reality was not a little disadvantageous to this famous historic, limestone district. In comparison with the fertile plains of Illinois, Iowa, and Indiana it yielded the palm to these rich prairie lands. Such must be the price paid for literary reputation. Even the famous Shenandoah Valley suffered in a similar manner. But after a few weeks spent in the less fertile regions of Virginia and the rugged, agriculturally inhospitable areas of West Virginia, the return to the Blue Grass district gave a much more favorable impression, for in comparison with hilly Kentucky and West Virginia it is rich beyond its enviable reputation. The acres of dark brown hemp tied up like shocks of corn, the tobacco curing in the fields and bulging from the great barns, and the golden corn were grateful to our eyes inured to rich western agricultural lands.

*Other occupations.*—Agriculture is not the only occupation the region supports. At Lynchburg we visited a tobacco manu-

factory, where chewing and smoking tobacco are prepared for the market. The sorting and stemming of the tobacco leaves by the happy, singing negro men and women, was a sight to be expected in such a factory, but surprises lay in the manner of improving the flavor of the cigars and the taste of the chewing tobacco. The brown plugs and twists, seen in the stores, give no hint to the observer that the leaves have been soaked in a brown, dirty-looking syrup, and that licorice, powdered peaches, plums, apricots, or locust fruits veneer the tightly pressed leaves to improve the taste. In a like manner those ignorant of the allurements of smoking never dream that the flavors are obtained by the addition of various perfumes.

*Oyster industry.*—The Chesapeake Bay region has long been famous for the production of oysters. The life and culture of these bivalves proved very interesting to the party of inland dwellers. The black stakes, peering above the water in the lower York and James Rivers, marked the limit of acreage rented from the state by the oyster farmers. We were told that the best seed oysters are obtained from the James River and are transplanted into the York, allowing from five hundred to a thousand bushels to the acre. After growing for about eighteen months, they are harvested and prepared in the factories for the market.

*History.*—The historic aspects of the region visited were in charge of Miss Emily J. Rice, head of the department of history in the School of Education. We saw the beginning of the Virginian commonwealth in the low church tower and the graveyard at Jamestown; followed its development at Williamsburg, Yorktown, and Richmond; reviewed the Peninsular Campaign; learned the meaning of Hampton Roads, Arlington, Mount Vernon, and the Shenandoah Valley; and traced the "Westward Movement" across the mountains into the wide, fertile plains of the Mississippi Valley.

*Method.*—The day was spent in the field, followed by a conference at night. At the conference the past observations and experiences were discussed and interpreted as far as possible.

The students prepared for the work of the following day by the use of maps or other material at hand. From information

thus obtained they predicted the appearance of the country, the geologic and cultural aspects, suggesting problems which would arise for solution. Notes were kept in the field, and, after the close of the field course, reports of the entire trip were written.

*Expense.*—The expense for the trip was one hundred and five dollars. This is exclusive of the tuition fee.

#### MATERIALS USED ON THE TRIP FROM CHICAGO TO WASHINGTON, DISTRICT OF COLUMBIA, AND RETURN

##### INSTRUMENTS:

Hammers, clinometers, compasses, aneroids.

##### MAPS:

United States Geological Survey. Topographic. The maps are listed in the order in which they were used. Where \*\* appear the country is not mapped.

##### *Chesapeake & Ohio Railroad—*

1. Kenova Quadrangle, Kentucky, West Virginia.
2. Huntington Quadrangle, West Virginia.
3. Charleston Quadrangle, West Virginia.
4. Raleigh Quadrangle, West Virginia.
5. Kanawha Falls Quadrangle, West Virginia.
6. Hinton Sheet, West Virginia.
7. Lewisburg Sheet, West Virginia, Virginia.

##### *Clifton Forge & Richmond Division, Chesapeake & Ohio Railway—*

8. Natural Bridge Sheet, Virginia.
9. Lexington Sheet, Virginia.
10. Lynchburg Sheet, Virginia.
11. Appomattox Sheet, Virginia.
12. Buckingham Sheet, Virginia.
13. Palmyra Sheet, Virginia.
14. Goochland Sheet, Virginia.
15. Richmond Sheet, Virginia.
16. Bermuda Hundred Sheet, Virginia.

\* \* \*

17. Norfolk Quadrangle, Virginia, North Carolina.
18. Washington Quadrangle, Maryland, Virginia, District of Columbia.

##### *Main Line, Chesapeake & Ohio Railroad (returning from Washington)—*

19. Mount Vernon Sheet, Virginia, Maryland.
20. Warrenton Sheet, Virginia.
21. Spottsylvania Sheet, Virginia.
22. Gordonsville Sheet, Virginia.
23. Harrisonburg Sheet, Virginia.
24. Staunton Sheet, Virginia, West Virginia.
25. Monterey Quadrangle, Virginia, West Virginia.

##### *Baltimore & Ohio Railroad Shenandoah Junction, West Virginia (route to Luray)—*

18. Washington Quadrangle, Maryland, Virginia, District of Columbia.

19. Harper's Ferry Sheet, Virginia, Maryland, West Virginia.

*Norfolk & Western Railroad from Shenandoah Junction to Basic City via Luray—*

20. Winchester Sheet, Maryland, Virginia, West Virginia.

21. Luray Sheet, Virginia.

22. Woodstock Sheet, Virginia.

23. Harrisonburg Sheet, Virginia.

24. Staunton Sheet, Virginia.

At Basic City the Main Line of Chesapeake & Ohio is reached, and maps read forward beginning with Staunton Sheet, No. 24, to No. 25.

25. Monterey Quadrangle, Virginia, West Virginia.

After leaving Monterey Quadrangle, return trip maps read backward from Natural Bridge Sheet, Virginia.

#### UNITED STATES GEOLOGIC ATLASES:

##### *Folios—*

Huntington, West Virginia.

Charleston, West Virginia.

Monterey, Virginia, West Virginia.

Raleigh, West Virginia.

Norfolk, Virginia, North Carolina.

Washington, District of Columbia.

Harper's Ferry, Virginia, Maryland, West Virginia.

Staunton, Virginia, West Virginia.

NOTE.—Topographic maps may be obtained by addressing the Director of the Geological Survey, Department of the Interior, Washington, District of Columbia, for three cents each by the hundred, or five cents apiece singly. Stamps are not accepted in payment. Maps should be described as in the list given above. Folios may be ordered in the same way, price twenty five cents.

##### *Other Maps—*

Geologic Maps of the United States.

State Maps of Illinois, Indiana, Kentucky.

Map showing occurrence of coal, oil, and gas in West Virginia by I. C. White, State Geologist.

Map showing the location of the battlefields of Virginia, Chesapeake & Ohio Railroad, 1906.

General Map of the Drift of the Northeastern United States, Sixth Annual Report, Plate XXIII.

#### BOOKS CARRIED FOR THE USE OF STUDENTS:

##### *Geology and Geography—*

Chamberlin and Salisbury, *Geology*.

Dana, *Textbook in Geology*.

Davis, *Physical Geography*.

West Virginia Geological Survey, Vol. Ia, 1904.

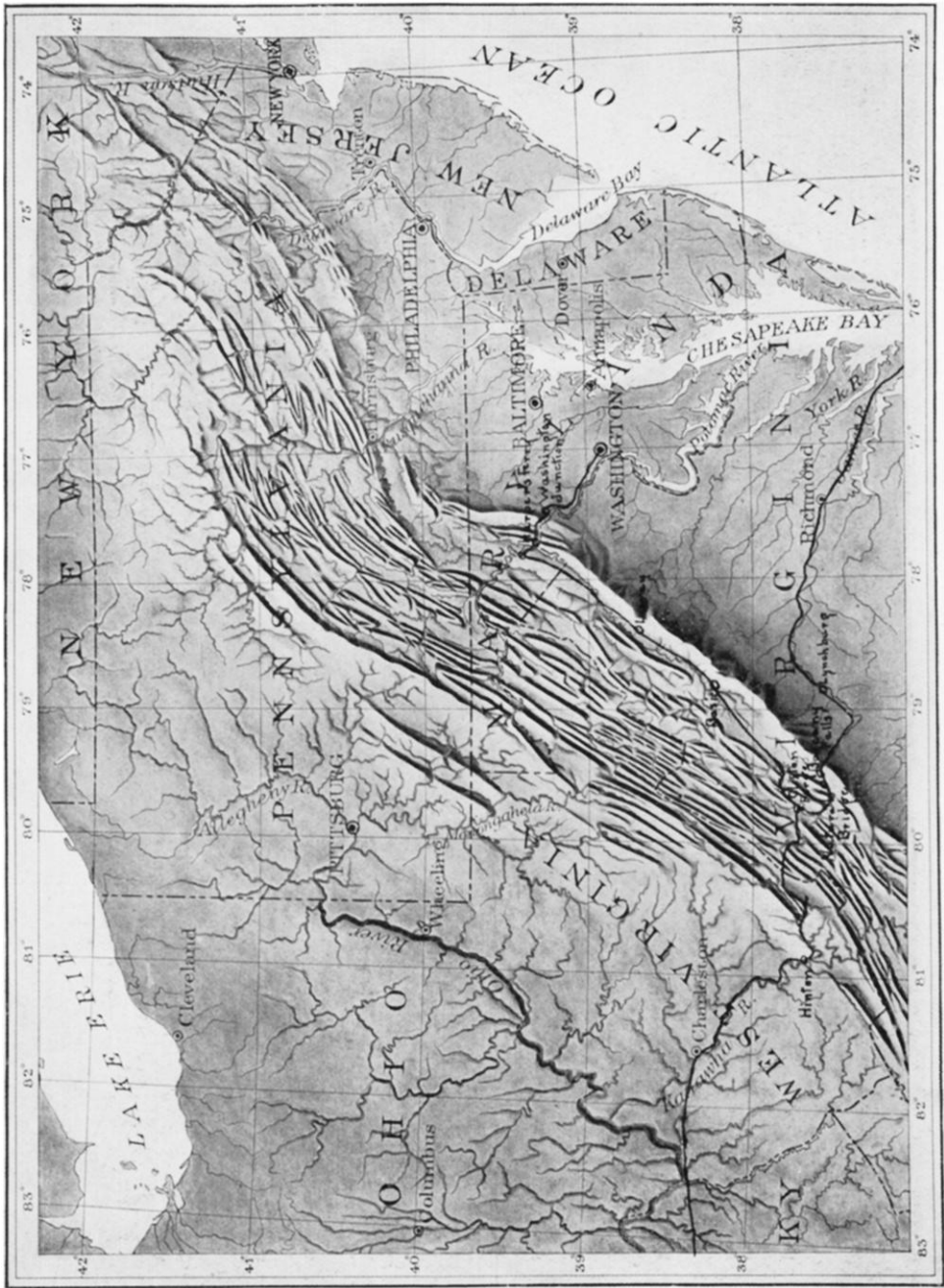
Froehling and Robertson, *A Hand Book of the Minerals and Mineral Resources of Virginia* (Richmond, Va.).

Shaler, *Dismal Swamp. Physiography of the United States*. (American Book Co.).

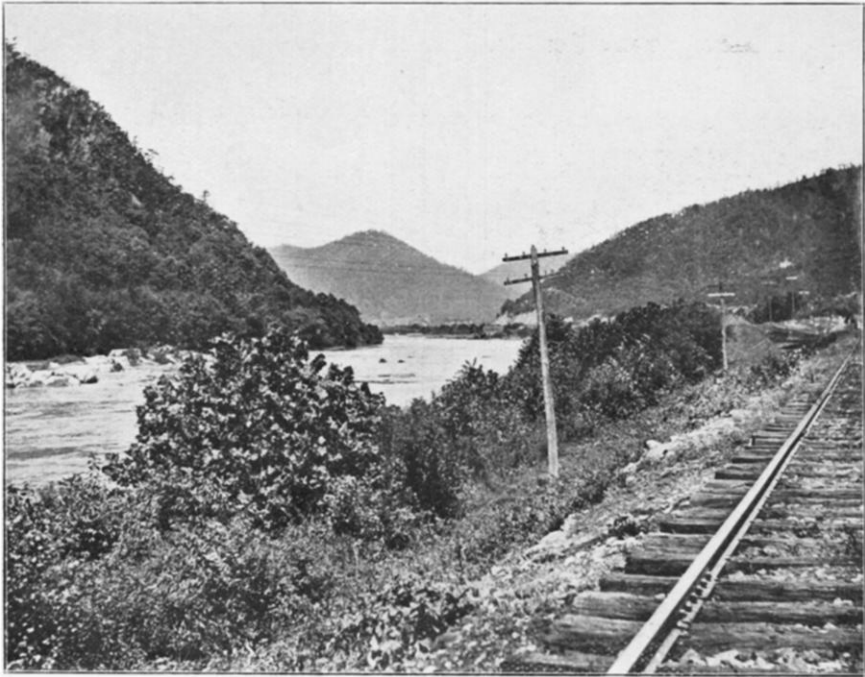


*Georg Thorne-Thomsen*

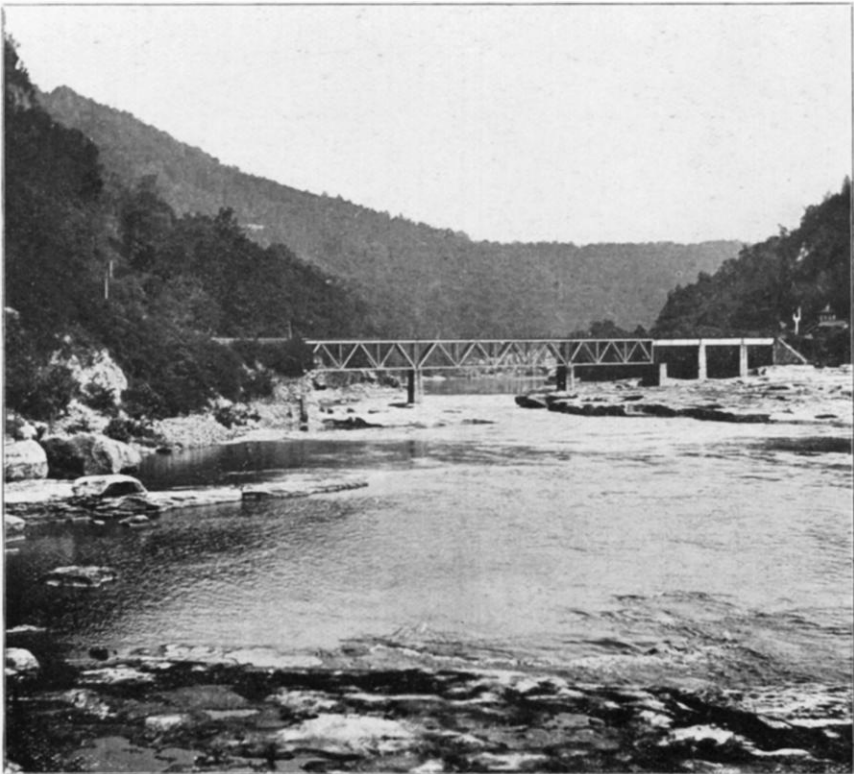
- |               |                  |                       |
|---------------|------------------|-----------------------|
| 1. Chicago    | 7. Hinton        | 13. Old Point Comfort |
| 2. Greensburg | 8. Clifton Forge | 14. Norfolk           |
| 3. Louisville | 9. South Glasgow | 15. Washington        |
| 4. Huntington | 10. Lynchburg    | 16. Washington Jr.    |
| 5. Charleston | 11. Richmond     | 17. Harper's Ferry    |
| 6. Thurmond   | 12. Williamsburg | 18. Luray             |



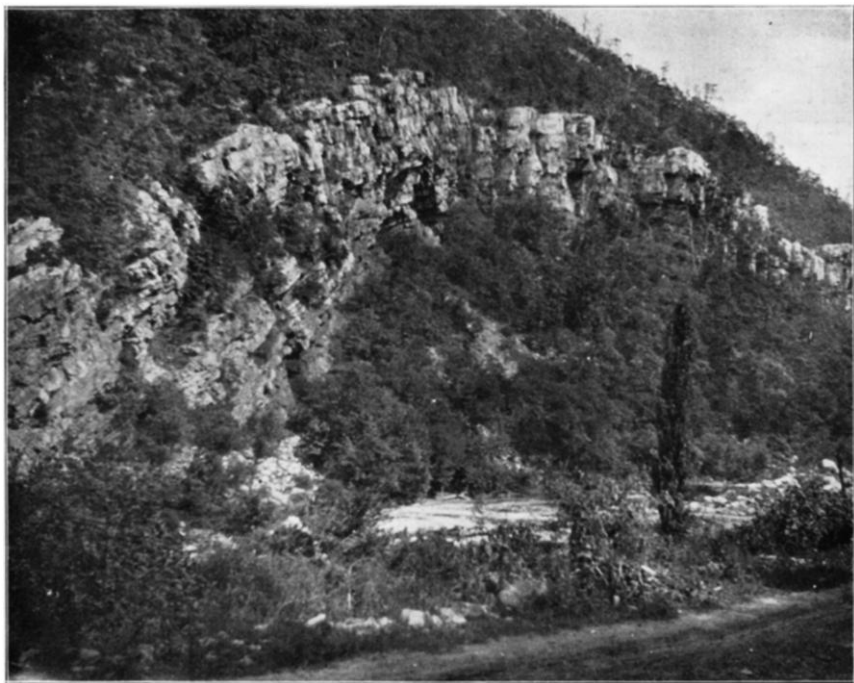
NORTHERN APPALACHIAN MOUNTAINS  
(*Geologic Atlas of the United States, Masontown, Uniontown Folio, Pennsylvania*)



JAMES RIVER CAÑON—BALCONY FALLS



NEW RIVER CAÑON—GAULEY JUNCTION



RAINBOW ARCH, CLIFTON FORGE, VIRGINIA



COASTAL PLAIN, FROM SAND-DUNE, CAPE HENRY, VIRGINIA

*Botany—*

Brittain and Brown.

*History—*

Semple, *American History and Its Geographic Conditions*.

Shaler, *Kentucky*.

Fiske, *Old Virginia and Her Neighbors*.

Cooke, *Virginia*.

Fisher, *Men, Women, and Manners in Colonial Times*, Vol. I.

Coman, *Industrial History of the United States*.

*Other References—*

Shaler, *Memoirs of Kentucky*.

Rogers, *Geology of Virginias*.

Keith, "Piedmont Plateau, Geological Survey," *Fourteenth Annual Report*, p. 366.

McGee, "History of the Piedmont Plateaus," *National Geographic Magazine*, Vol. VII (1895).

Davis, "Stream Contests along the Blue Ridge," *Bulletin Geographic Society of Pennsylvania*, April, 1903.

Semple, "Influence of Appalachian Barrier upon Colonial History," *Journal of School Geography*, Vol. I.

Fontaine, "Some Points in the Geology of the Blue Ridge in Virginia," *American Journal of Science*, Vol. IX (1875).

Keith, "Geologic Structure of the Blue Ridge," *American Geologist*, Vol. X (1892).

Dryer, *Studies in Indiana Geography*.

Gannett, *A Gazetteer of Virginia*, Department of the Interior, United States Geological Survey.

"Kentucky River Basins," *Journal of Geology*, Vol. IV, p. 671.

"Kanawha River Basins," *ibid.*, p. 669.

Randolph, "People of Virginia," *National Geographic Magazine*, Vol. VII.

McGee, "Geographic Development of the District of Columbia," *ibid.*, Vol. IX.

Brigham, *Geographic Influences in American History*.

Jefferson, "Atlantic Estuarine Tides," *National Geographic Magazine*, Vol. IX.

Puston, "Tides of Chesapeake Bay," *ibid.*, Vol. X.

Tight, "Drainage Modifications in Southeastern Ohio and Adjacent Parts of West Virginia and Kentucky" *Professional Paper 13*, United States Geological Survey.

Walcott, "The Natural Bridge of Virginia," *National Geographic Magazine*, Vol. V.

## ILLUSTRATIVE READING:

Allen, *Reign of Law*.

Churchill, *The Crisis*.

Dye, *The Conquest*.

Fox, *Little Shepherd of Kingdom Come*.

Johnston, *To Have and to Hold*.

Johnston, *Audrey*.

Glasgow, *The Battleground*.